

What is claimed is:

- 1           1. An optical device comprising:  
2           an optically transparent component characterized by a component light transmission  
3 variation, the component transmission variation being a function of at least one physical  
4 characteristic of the optically transparent component; and  
5           an anti-reflective coating disposed on a first side of the optically transparent  
6 component, the anti-reflective coating including at least one layer of material such that the  
7 optical device transmission variation is less than the component transmission variation.
- 1           2. The optical device of claim 1, wherein the optical device transmission variation is  
2 equal to approximately one-sixth the component transmission variation.
- 1           3. The optical device of claim 1, wherein the at least one characteristic is birefringence.
- 1           4. The optical device of claim 1, wherein the at least one characteristic is refractive  
2 index inhomogeneity.
- 1           5. The optical device of claim 1, wherein the at least one characteristic is a thickness  
2 variation of the optically transparent component.
- 1           6. The optical device of claim 1, wherein the at least one layer includes  $\text{Al}_2\text{O}_3$ .
- 1           7. The optical device of claim 1, wherein the at least one layer includes  $\text{MgF}_2$ .
- 1           8. The optical device of claim 1, wherein the anti-reflective coating includes a plurality  
2 of layers.
- 1           9. The optical device of claim 8, wherein the plurality of layers includes at least one

2 layer comprising Al<sub>2</sub>O<sub>3</sub>.

1 10. The optical device of claim 8, wherein the plurality of layers includes at least one  
2 layer comprising MgF<sub>2</sub>.

1 11. The optical device of claim 1, wherein the optically transparent component is  
2 comprised of a glass material.

1 12. The optical device of claim 1, wherein the optically transparent component is  
2 comprised of silica.

1 13. The optical device of claim 12, wherein the optically transparent component is  
2 comprised of fused silica.

1 14. The optical device of claim 1, wherein the optically transparent component is  
2 comprised of quartz glass.

1 15. A photolithography system for making at least one semiconductor device,  
2 comprising:  
3 an illumination light source adapted to transmit illumination light characterized by a  
4 center wavelength;  
5 a projection optical system optically coupled to the illumination light source, the  
6 projection optical system being configured to project the illumination light onto the at least one  
7 semiconductor device; and  
8 a photomask disposed between the illumination light source and the projection optical  
9 system, the photomask including an optically transparent component and a coating disposed on  
10 a first side of the optically transparent component, the optically transparent component being  
11 characterized by a component transmission variation, the coating including at least one layer of  
12 anti-reflective material such that a photomask transmission variation is less than the component

13 light transmission variation.

1 16. The system of claim 15, wherein the photomask transmission variation is equal to  
2 approximately one-sixth the component transmission variation.

1 17. The system of claim 15, wherein the center wavelength is less than or equal to  
2 250nm.

1 18. The system of claim 15, wherein the center wavelength is substantially 248nm.

1 19. The system of claim 15, wherein the wavelength is substantially 193nm.

1 20. The system of claim 15, wherein the wavelength is substantially 157nm.

1 21. The system of claim 15, wherein the at least one layer includes Al<sub>2</sub>O<sub>3</sub>.

1 22. The system of claim 15, wherein the at least one layer includes MgF<sub>2</sub>.

1 23. The system of claim 15, wherein the anti-reflective coating includes a plurality of  
2 layers.

1 24. The system of claim 23, wherein the plurality of layers includes at least one layer  
2 comprising Al<sub>2</sub>O<sub>3</sub>.

1 25. The system of claim 23, wherein the plurality of layers includes at least one layer  
2 comprising MgF<sub>2</sub>.

1 26. The system of claim 15, wherein the first side is a light incident side with respect to  
2 the illumination light source.

1 27. The system of claim 26, wherein the device pattern corresponds to an electronic  
2 circuit in a semiconductor device.

1 28. The system of claim 26, wherein the device pattern corresponds to a mechanical  
2 micro-structure in a MEMs device.

1 29. The system of claim 26, wherein the device pattern corresponds to an optical  
2 component.

1 30. A method for making an optical device, the method comprising:  
2 providing an optically transparent component characterized by a component light  
3 transmission variation, the component transmission variation being a function of at least one  
4 physical characteristic of the optically transparent component; and  
5 disposing a coating on a first side of the optically transparent component, the coating  
6 including at least one layer of anti-reflective material such that the optical device transmission  
7 variation is less than the component transmission variation.

1 31. The method of claim 30, wherein the at least one layer includes Al<sub>2</sub>O<sub>3</sub>.

1 32. The method of claim 30, wherein the at least one layer includes MgF<sub>2</sub>.

1 33. The method of claim 30, wherein the anti-reflection coating includes a plurality of  
2 layers.

1 34. The method of claim 33, wherein the plurality of layers includes at least one layer  
2 comprising Al<sub>2</sub>O<sub>3</sub>.

1 35. The method of claim 33, wherein the plurality of layers includes at least one layer

2 comprising MgF<sub>2</sub>.

1 36. The method of claim 30, wherein the optically transparent component is comprised  
2 of a glass material.

1 37. The method of claim 30, wherein the optically transparent component is comprised  
2 of silica.

1 38. The method of claim 37, wherein the optically transparent component is comprised  
2 of fused silica.

1 39. The method of claim 30, wherein the optically transparent component is comprised  
2 of quartz glass.

1 40. method of claim 39, wherein the device pattern corresponds to an electronic circuit.

1 41. The method of claim 39, wherein the device pattern corresponds to a mechanical  
2 micro-structure in a MEMs device.

1 42. The method of claim 39, wherein the device pattern corresponds to an optical  
2 component.

1 43. A method for making at least one semiconductor device using a photolithography  
2 system, the photolithography system including an illumination light source adapted to transmit  
3 illumination light characterized by a center wavelength and a projection optical system  
4 optically coupled to the illumination light source, the projection optical system being  
5 configured to project the illumination light onto the at least one semiconductor device, the  
6 method comprising:

7 disposing a photomask between the illumination light source and the projection optical

8 system, the photomask including an optically transparent component and a coating disposed on  
9 a first side of the optically transparent component, the photomask also including a pattern  
10 disposed on a second side of the component opposite the first side, the optically transparent  
11 component being characterized by a component transmission variation, the coating including at  
12 least one layer of anti-reflective material such that a photomask transmission variation is less  
13 than the component transmission variation;

14 activating the illumination light source being activated to thereby propagate  
15 illumination light through the photomask; and

16 projecting the light propagating through the photomask from the projection optical  
17 system onto the at least one semiconductor device, whereby the pattern is transferred onto the  
18 semiconductor device.

1 44. The method of claim 43, wherein the pattern corresponds to an electronic circuit.

1 45. The method of claim 43, wherein the pattern corresponds to a mechanical  
2 micro-structure in a MEMs device.

1 46. The method of claim 43, wherein the device pattern corresponds to an optical  
2 component.

1 47. The method of claim 43, wherein the at least one layer includes Al<sub>2</sub>O<sub>3</sub>.

1 48. The method of claim 43, wherein the at least one layer includes MgF<sub>2</sub>.

1 49. The method of claim 43, wherein the anti-reflection coating includes a plurality of  
2 layers.

1 50. The method of claim 43, wherein the plurality of layers includes at least one layer  
2 comprising Al<sub>2</sub>O<sub>3</sub>.

1 51. The method of claim 43, wherein the plurality of layers includes at least one layer  
2 comprising MgF<sub>2</sub>.

1 52. The method of claim 43, wherein the optically transparent component is comprised  
2 of a glass material.

1 53. The method of claim 43, wherein the optically transparent component is comprised  
2 of silica.

1 54. The method of claim 43, wherein the optically transparent component is comprised  
2 of fused silica.

1 55. The method of claim 43, wherein the optically transparent component is comprised  
2 of quartz glass.